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Intrinsic switching field distribution in perpendicular recording media: numerical study of the $\Delta H(M, \Delta M)$ method KARIN DAHMEN, YANG LIU, Department of Physics, University of Illinois at Urbana-Champaign, Urbana, IL 61801, ANDREAS BERGER, San Jose Research Center, Hitachi Global Storage Technologies, San Jose, CA 95120 — We present a numerical study of the $\Delta H(M, \Delta M)$ method and its ability to accurately determine intrinsic switching field distributions in interacting granular magnetic materials such as perpendicular recording media. In particular, we study how this methodology fails for large ferromagnetic inter-granular interactions, at which point strongly correlated magnetization reversal sets in that cannot be properly represented by the $\Delta H(M, \Delta M)$ method, which is based on a mean-field approximation. In this study, we use a 2-dimensional array of square hysterons that have a distribution of intrinsic switching fields and ferromagnetic next-neighbor interactions J. We find the $\Delta H(M, \Delta M)$ method to be very accurate for small J values, while substantial errors develop once the effective exchange field becomes comparable with the intrinsic switching field distribution width, corroborating earlier results from micromagnetic simulations. This failure is correlated with deviations from data set redundancy, which is a key property of the mean-field approximation. Thus, the $\Delta H(M, \Delta M)$ method fails in a well defined and quantifiable manner that can be easily assessed from the data sets alone.

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